

CLAIMS

1. A releasable fastener system comprising:

a loop portion comprising a support and a loop material disposed on a surface thereon;

a hook portion comprising a support and a plurality of hook elements disposed on a surface, wherein the plurality of hook elements comprises a magnetorheological elastomer adapted to change a shape orientation and/or flexural modulus of the hook elements upon receipt of a magnetic signal; and

an activation device coupled to the plurality of hook elements, the activation device being operable to selectively provide the magnetic signal to the hook elements and effectuate a change in the shape orientation and/or flexural modulus of the hook elements to reduce or increase a shear force and/or a pull-off force, and wherein the change in the flexural modulus of the hook elements provides a damping capability to the fastener system.

2. The releasable fastener system of Claim 1, wherein the magnetic signal is a magnetic field.

3. The releasable fastener system of Claim 1, wherein the damping capability is variable.

4. The releasable fastener system of Claim 1, wherein the magnetorheological elastomer comprises ferromagnetic or paramagnetic particulates in an elastomeric material, wherein the elastomeric material comprises poly-alpha-olefins, natural rubber, silicone, polybutadiene, polyethylene, polyisoprene, polyurethane, or combinations comprising at least one of the foregoing polymeric materials.

5. The releasable fastener system of Claim 4, wherein the particulates comprise iron alloys, nickel alloys, manganese alloys, cobalt alloys, or compounds comprising oxides, chlorides, sulfates, sulfides, or hydrates of cerium, chromium,

cobalt, dysprosium, erbium, europium, gadolinium, holmium, iron, manganese, neodymium, nickel, praseodymium, samarium, terbium, titanium, uranium, vanadium, or yttrium.

6. The releasable fastener system of Claim 4, wherein the particulates comprise nanometer sized particles.

7. The releasable fastener system of Claim 4, wherein the loop material comprises a shape adapted to be engaged with the hook elements when the hook portion is pressed into face-to-face engagement with the loop portion.

8. The releasable fastener system of Claim 1, wherein the hook elements comprise a shape comprising a J-shaped orientation, an L-shape, a mushroom shape, a knob shape, a multi-tined anchor shape, a T-shape, a spiral shape, or combinations comprising at least one of the foregoing shapes.

9. The releasable fastener system of Claim 1, wherein the shape orientation of the plurality of hook elements changes from an inverted J-shaped orientation to a substantially straightened orientation upon receipt of the activation signal.

10. The releasable fastener system of Claim 1, wherein the loop portion and the hook portion engages to form an interlocking system for the duration of the magnetic signal and disengages in the absence of the magnetic signal.

11. The releasable fastener system of Claim 10, wherein the strength of the engagement of the interlocking system increases with increasing magnetic signal strength.

12. The releasable fastener system of Claim 1, wherein the magnetic signal is of a strength sufficient to increase the flexural modulus of the hook elements to result in brittle fracture of the hook elements when the fastener system is subjected to a shear force.

13. The releasable fastener system of Claim 1, wherein the loop material comprises a magnetorheological elastomer adapted to change a flexural modulus of the loop material upon receipt of the magnetic signal.

14. The releasable fastener system according to Claim 1, wherein the loop portion support and the hook portion support are fabricated from an inflexible material.

15. An engine mount comprising the releasable fastener system of Claim 1.

16. A process for operating a releasable fastener system, the process comprising:

contacting a loop portion to a hook portion to form a releasable engagement, wherein the loop portion comprises a support and a loop material disposed on a surface thereon, and wherein the hook portion comprises a support and a plurality of hook elements disposed on a surface, wherein the plurality of hook elements comprises a magnetorheological elastomer adapted to change a shape orientation and/or flexural modulus upon receipt of an magnetic signal, wherein the change in the flexural modulus of the hook elements provides a damping capability to the fastener system;

maintaining constant shear and pull-off forces in the releasable engagement;

selectively introducing the magnetic signal to the hook elements, wherein the magnetic signal is effective to change a shape orientation and/or flexural modulus; and

reducing or increasing shear and/or pull-off forces in the releasable engagement.

17. The process according to Claim 16, wherein the plurality of hook elements comprise a shape comprising a J-shaped orientation, an L-shape, a

mushroom shape, a knob shape, a multi-tined anchor shape, a T-shape, a spiral shape, or combinations comprising at least one of the foregoing shapes.

18. A hook portion for a releasable fastener system comprising:

a support and

a plurality of hook elements disposed on a surface of the support, wherein the plurality of hook elements comprise a magnetorheological elastomer adapted to change a shape orientation and/or a flexural modulus upon receipt of a magnetic signal.

19. The hook portion according to Claim 18, wherein the support comprises a metal, a plastic, a fabric, or a combination comprising at least one of the foregoing materials.

20. The hook portion according to Claim 18, wherein the hook elements comprise a shape comprising a J-shaped orientation, an L-shape, a mushroom shape, a knob shape, a multi-tined anchor shape, a T-shape, a spiral shape, and combinations comprising at least one of the foregoing shapes.

21. A releasable fastener system comprising:

a loop portion comprising a support and a loop material disposed on a surface thereon;

a hook portion comprising a support and a plurality of hook elements disposed on a surface, wherein the plurality of hook elements comprises a magnetorheological elastomer adapted to change a shape orientation and/or flexural modulus; and

means for changing the shape orientation and/or flexural modulus to reduce a shear force and/or a pull-off force of an engaged hook and loop portion and to provide a variable damping capability to the fastener system.